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Redescription and Systematic Position of *Pleurobranchaea obesa* (Verrill, 1882) (Opisthobranchia: Pleurobranchaeidae)

by

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Abstract. Rediscovery of specimens of *Koonsia obesa* Verrill, 1882, has permitted the amplification of the original description and provided information that permits the reassessment of its generic status. *Koonsia* Verrill, 1882, is regarded as a junior subjective synonym of *Pleurobranchaea* Meckel in Leue, 1813. *Pleurobranchaea confusa* Marcus & Gosliner, 1984, is regarded as a junior subjective synonym of *Pleurobranchaea obesa* (Verrill, 1882).

INTRODUCTION

The status of *Koonsia obesa* Verrill, 1882, has been the subject of controversy and confusion, largely owing to the incomplete original description of the species. Compounding the problem are the facts that specimens from Verrill's type series have been considered as a distinct species, *Pleurobranchaea confusa* Marcus & Gosliner, 1984, and that the reproductive organs of the holotype have been removed and apparently lost.

Koonsia obesa Verrill, 1882, is the type species of *Koonsia* Verrill, 1882, by monotypy. The genus has been considered as distinct (Verrill, 1882; Pilsbry, 1896; Abbott, 1974; Marcus, 1977; Marcus & Gosliner, 1984) or as a junior synonym of *Pleurobranchaea* Meckel in Leue, 1813 (Bergh, 1896; Willan, 1983). Marcus & Gosliner (1984) suggested that it was likely that specimens matching the description of *Koonsia obesa* would be rediscovered and that a definitive judgement about the status of the genus must await re-examination of the type species.

During the course of examining material in the collections of the Division of Mollusks, National Museum of Natural History, specimens that are identifiable with *Koonsia obesa* were found. This paper more fully describes the morphology of the species and discusses its generic placement and affinities with other members of the family.

DESCRIPTION

Pleurobranchaea obesa (Verrill, 1882)

Koonsia obesa Verrill, 1882:545; 1884:pl. 28 (fig. 7); 1885: 571, fig. 107. Abbott, 1974:349, fig. 2046. Marcus & Gosliner, 1984:46, fig. 25C.

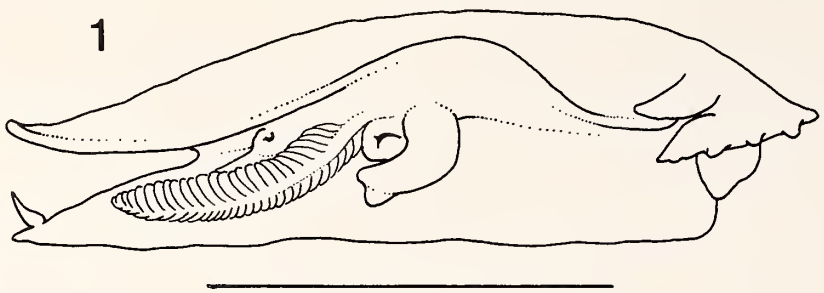
Pleurobranchaea obesa (Verrill, 1882). Bergh, 1897:30, pl. 7 (figs. 19–21).

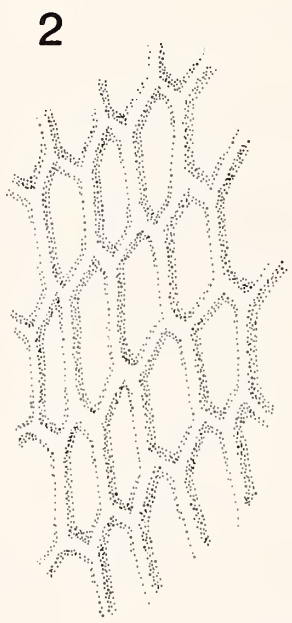
Pleurobranchaea confusa Marcus & Gosliner, 1984:12, fig. 3, **syn. nov.**

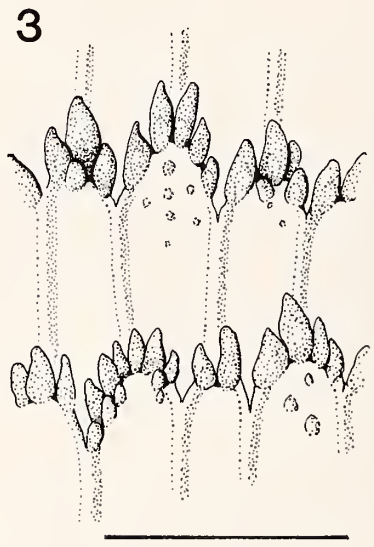
Material examined: (1) **Holotype:** National Museum of Natural History, Washington, D.C., USNM 784655, 1 specimen, "off Martha's Vineyard" (off Delaware) (39°53′N, 69°50′30″W), 258 fm (472 m), *Fish Hawk,* USFC station 939, 4 August 1881. (2) **Paratype** (holotype of *Pleurobranchaea confusa* Marcus & Gosliner, 1984): USNM 784657, 1 specimen, "off Delaware Bay" (38°35′N, 73°13′W), 400 m, 10 October 1881. (3) USNM 784658, 1 specimen, "off Martha's Vineyard" (39°55′31″N, 70°39′W), 193 fm (353 m), *Fish Hawk,* USFC station 1154, 4 October 1882. (4) USNM 40132, 1 specimen, "off Nantucket Shoals," RV *Albatross,* station 2262, September 1884. (5) USNM 812662, 1 specimen, 161 km (100 mi) S of Mobile, Alabama (29°10′N, 88°09′W), 260 fm (476 m), RV *Oregon,* 5 March 1955. (6) USNM 578212, 3 specimens, off Bahama Islands (29°59′N, 80°08′W), 210–220 fm (384–403 m), RV *Oregon,* 9 February 1965.

The anatomy of all the material was examined and the following re-description is based on a composite of the material. The radula of the holotype was broken into several pieces and its formula could not be determined. The reproductive organs of the holotype had been removed and are no longer present.

External morphology: The preserved specimens (Figure 1) range from 50 to 100 mm in length. The holotype is the largest specimen examined (although Verrill [1882] mentioned that the holotype was 128 mm in length, it is







Explanation of Figures 1 to 3

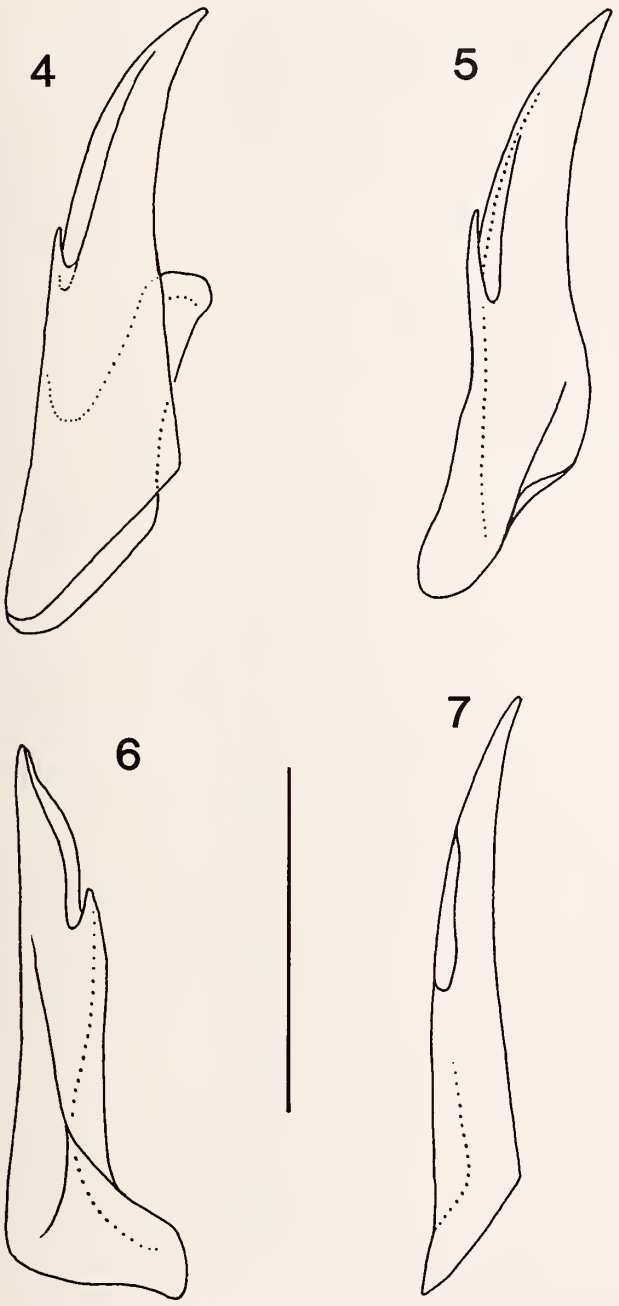
Figure 1. *Pleurobranchaea obesa* (Verrill, 1882). Lateral view of preserved animal (U.S.N.M. 578212). Scale = 25 mm.

Figures 2 and 3. *Pleurobranchaea obesa* (Verrill, 1882). Jaw platelets from different portions of jaw (U.S.N.M. 578212). Scale = 50 μm.

presently more contracted). The smooth notum covers most of the animal and overhangs the foot. The oral veil is broad with scattered tubercles along its margin. The oral tentacles and the well-separated rhinophores are involute. A spur is present on the posterodorsal portion of the foot in all specimens examined. A pedal gland is situated on the posteroventral portion of the foot. The genital apertures are located anterior to the base of the gill. The tripinnate gill consists of 31–35 primary leaflets on either side of the central rachis. Immediately behind the posterior base of the gill is the anus.

Internal morphology. The buccal mass is large, comprising one-third to one-half of the body length. The jaws are thin and fragile and are composed of numerous polygonal platelets. The shape of the platelets varies as does the number of irregular denticles on their outer surface (Figures 2, 3). The radula is broad and golden brown in color. The radular formula in one specimen (U.S.N.M. 578212) examined is 31 × 75.0.75. The teeth in the holotype (Figures 4–8) and a second specimen (U.S.N.M. 578212) are elongate and sharply acute with a single denticle present on the inner side of most teeth. The outer 5 or 6 teeth lack a denticle.

The reproductive system (Figure 11) is androdiaulic. The narrow preampullary duct expands into an elongate, convoluted ampulla. The ampulla bifurcates into the oviduct and vas deferens. The oviduct expands into a lobate, glandular receptaculum seminis and again narrows. The ectal (distal) portion of the oviduct is elongate and convoluted. The oviduct joins the bulbous vagina near the base of the large saccate bursa copulatrix. The vagina is joined with the female gland mass near the female gono-



Explanation of Figures 4 to 7

Figures 4 to 6. *Pleurobranchaea obesa* (Verrill, 1882). Inner lateral teeth of holotype. Scale = 500 μm.

Figure 7. *Pleurobranchaea obesa* (Verrill, 1882). Outer lateral tooth of holotype. Scale = 500 μm.

pore. The mucous gland forms the largest portion of the female gland mass and a smaller albumen gland is present near the junction of the gland mass with the vagina. A distinct membrane gland was not discernible. A short distance beyond the bifurcation of the ampulla, the vas deferens expands into a globular prostate which is composed of numerous anastomosing tubules. The vas deferens again emerges from the ectal (distal) portion of the prostate where it is elongate and convoluted. It enters the penial sheath at the ental (proximal) end. The penis sheath is contained within the membranous penial sac, which has a retractor muscle at its ental (proximal) end. The penial sheath has a ridged, bifurcate apex. The penis proper (Figure 9) is thick and muscular basally and gradually narrows and becomes laterally compressed. The penis has an external cuticle over much of its length. The tip of the penis bears five to nine tubercles (Figure 10).

DISCUSSION

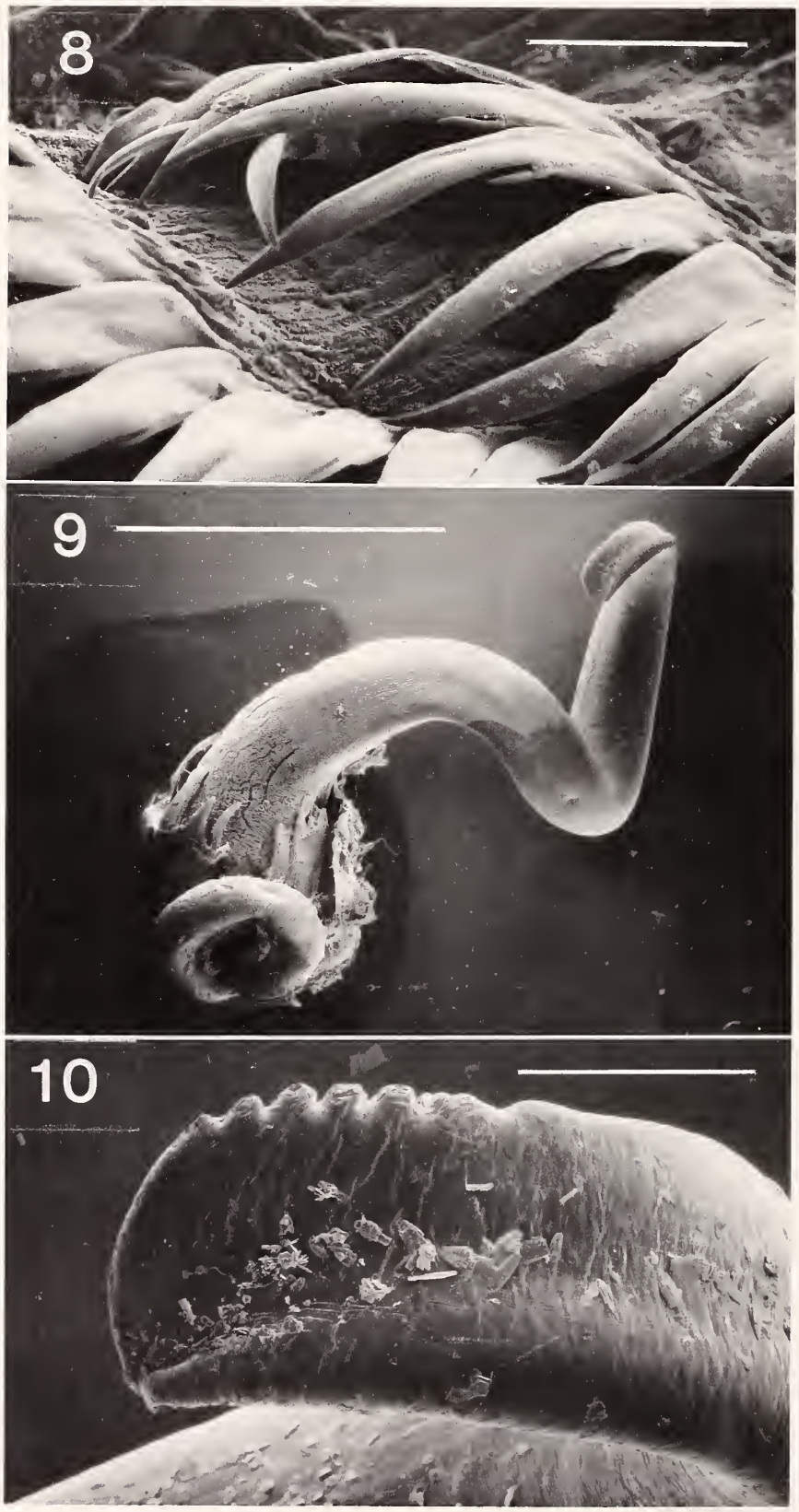
The status of *Koonsia* Verrill, 1882, has remained in question since its original description. Several workers have regarded *Koonsia* as a junior subjective synonym of *Pleurobranchaea* Meckel in Leue, 1813 (Bergh, 1897; Vayssière, 1901; Willan, 1977, 1983), while others (Pilsbry, 1896; Abbott, 1974; Marcus, 1977) have considered it as a distinct genus.

The original description of *Koonsia obesa* Verrill, 1882, emphasized two differences between *Koonsia* and *Pleurobranchaea*. In *Koonsia* the mantle has a distinct edge which overhangs the body laterally and posteriorly, and the penis is armed with small hooks.

Part of the confusion regarding *Koonsia obesa* stems from the fact that Verrill described the genus as being characterized by having an overhanging mantle edge, but later (1884, pl. 28, fig. 7) depicted a specimen in which the mantle edge does not overhang the foot. There is some question as to whether the animal depicted in the figure is conspecific with *Koonsia obesa* or whether its shape is simply an artifact of preservation. In the figure legend, Verrill noted that in the specimen that he figured "the dorsal part of the body is much contracted." This suggests that its appearance is due to contraction during preservation. It should be emphasized that the systematic status of the specimen that Verrill depicted has no bearing on the taxonomy of *Koonsia obesa*. In the holotype, which I re-examined, the mantle is overhanging with a distinct edge, as Verrill orginally described. If the specimen he figured is distinct, then it must receive a new name. The examination of material in this study yielded no specimens with a contracted mantle.

Bergh (1897) examined a paratype of *Koonsia obesa* and stated that the penis was unarmed. I also found that a second paratype had an unarmed penis (Marcus & Gosliner, 1984), but suggested that these specimens represent a distinct species and described them as *Pleurobranchaea confusa*. The holotype of *Koonsia obesa* was also examined by Bergh. As the reproductive organs have been removed from the specimen, the question of penial armature of *K. obesa* remains unanswered.

The present material possesses an overhanging mantle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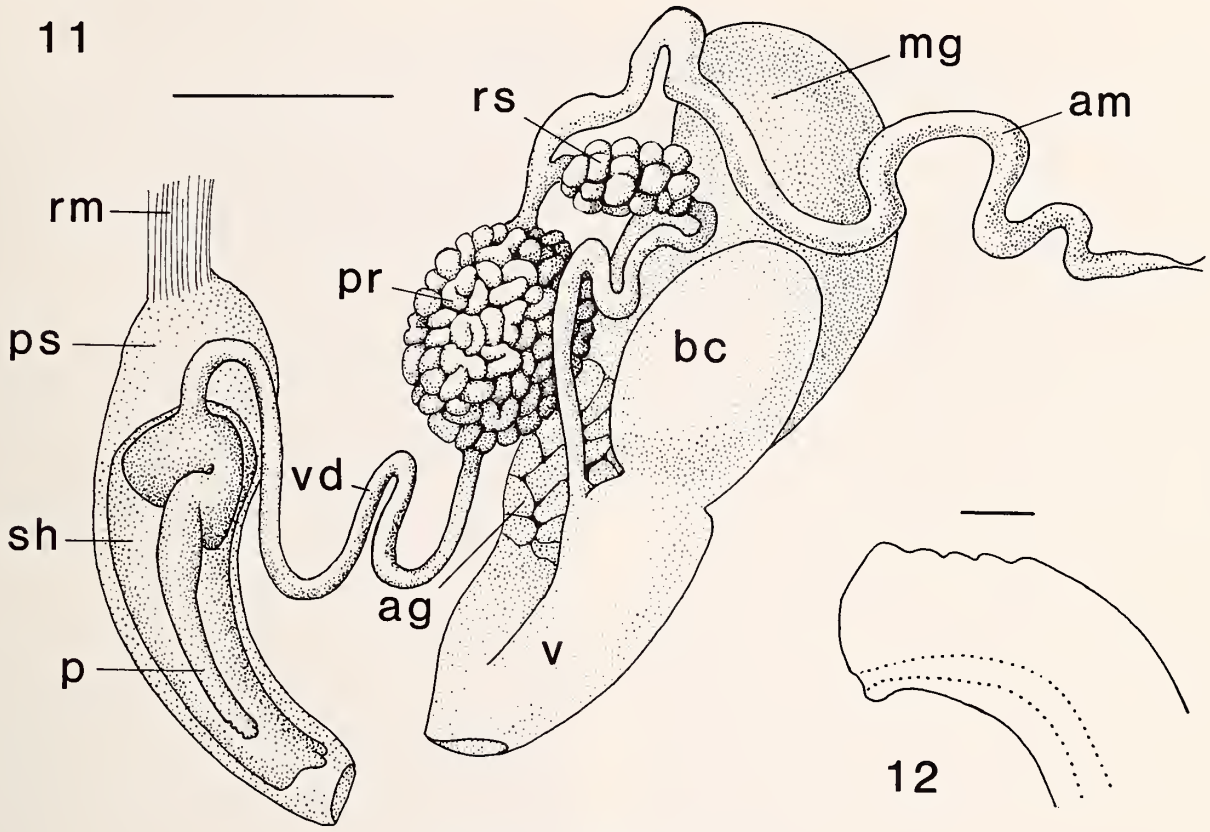

Explanation of Figures 11 and 12

Figure 11. *Pleurobranchaea obesa* (Verrill, 1882). Reproductive system (U.S.N.M. 578212): ag, albumen gland; am, ampulla; bc, bursa copulatrix; mg, mucous gland; p, penial papilla; pr, prostate; ps, penial sac; rm, retractor muscle; rs, receptaculum seminis; sh, penial sheath; v, vagina; vd, vas deferens. Scale = 10 mm.

Figure 12. *Pleurobranchaea obesa* (Verrill, 1882). Penis of paratype specimen (holotype of *Pleurobranchaea confusa* Marcus & Gosliner, 1984). Scale = 250 μm.

and a row of cuticular papillae on the tip of the penis. The geographical proximity of the localities from which the present material was collected to the type locality, and the morphological similarity of it to Verrill's material, strongly suggest that all the present material is conspecific with *Koonsia obesa*.

With an increase in the knowledge of the morphology of *Koonsia obesa* it is appropriate to reassess the status of the genus within the Pleurobranchaeidae. *Euselenops* Pilsbry, 1896, *Pleurobranchella* Thiele, 1925, and *Gigantonotum* Lin Guangyu & Tchang Si, 1965, possess unicuspid teeth, while in *Pleurobranchaea* Meckel in Leue, 1813, and *Koonsia* Verrill, 1882, the majority of the teeth is bicuspid. A variable number of outer teeth may be unicuspid in *Pleurobranchaea* species, and the bicuspid cusps of *P. californica* are rudimentary. *Euselenops* has soft conical papillae covering the penis and in *Pleurobranchella* there are chitinous hooks. The reproductive morphology of *Gigantonotum* remains unknown. *Euselenops* is unique among the Pleurobranchaeidae in that the prostatic cells

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Explanation of Figures 8 to 10

Figure 8. *Pleurobranchaea obesa* (Verrill, 1882). Scanning electron micrograph of radular teeth of holotype. Scale = 200 μm.

Figure 9. *Pleurobranchaea obesa* (Verrill, 1882). Scanning electron micrograph of penis (U.S.N.M. 578212). Scale = 5.0 mm.

Figure 10. *Pleurobranchaea obesa* (Verrill, 1882). Scanning electron micrograph of penial papilla (U.S.N.M. 578212). Scale = 500 μm.

are contained within the vas deferens rather than forming a distinct prostate gland. The penial morphology of *Pleurobranchaea* is variable (MARCUS & GOSLINER, 1984), although there appears to be little intraspecific variability (present study). Some species possess an entirely unarmed penis, while in others there may be either an internal stylet or an external cuticle.

The overhanging mantle, described by VERRILL (1884) as a distinctive feature of *Koonsia* and observed in all of the present material, is not unique to *K. obesa*. It is also found in *Pleurobranchella nicobarica* Thiele, 1925, *Pleurobranchaea confusa, P. brockii* Bergh, 1897, and *Gigantonotum album* Lin Guangyu & Tchang Si, 1965 (MARCUS & GOSLINER, 1984) and cannot be utilized for generic separation. *Koonsia obesa* closely resembles members of the genus *Pleurobranchaea* in all aspects of its external and internal anatomy. There is no basis for maintaining the separation of genera. I, therefore, agree with BERGH (1897), VAYSSIÈRE (1901) and WILLAN (1977, 1983) that *Koonsia* should be regarded as a junior subjective synonym of *Pleurobranchaea*.

Pleurobranchaea obesa is similar in its external appearance to *P. confusa* Marcus & Gosliner, 1984. Owing to the fact that the holotype of *P. confusa* is also a paratype of *P. obesa,* it is imperative to compare these taxa. Both species have an overhanging mantle and are similar in most aspects of their external and internal morphology. MARCUS & GOSLINER (1984, fig. 3D) reported that the tip of the penis of *P. confusa* possesses two cuticular bulbs. The cuticular tubercles described for *P. obesa* were not observed. However, upon re-examination of the penis of the holotype of *P. confusa* (present study) it was determined that the penis has an external cuticle and that five low-lying tubercles are present (Figure 12). It was also noted that the dorsalmost of the cuticular bulbs was actually an air bubble trapped in the mounting medium. Therefore, there is no significant morphological difference between the two taxa, and *P. confusa* Marcus & Gosliner, 1984, is regarded as a junior synonym of *P. obesa* (Verrill, 1882).

The penial morphology of the seven specimens of *Pleurobranchaea obesa* examined in this study varied only in the number of tubercles on the papilla. The shape of the penis and the elaboration of the cuticle were consistent in all material. The only other member of *Pleurobranchaea* that has an external penial cuticle is *P. notmec* Marcus & Gosliner, 1984. In this species the penis has about six loops within the penial sac, in contrast to the simple penis of *P. obesa*.

Consistent and fundamental differences in penial morphology, cuticularization, and elaboration clearly distinguish five species of *Pleurobranchaea* in the western Atlantic (MARCUS & GOSLINER, 1984). These characteristics do not vary significantly with size or age of the animals and provide the basis for the separation of species.

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